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RECYCLING WASTES: SOMETHING TO SING ABOUT

by MICHELLE HIBLER

An international news story recently announced that the top song in China these days is a lilting little number entitled "The People Gloriously Carry Manure to the Fields". If the song is a bit too earthy to make it on music charts in Western countries, it not only points out the difference in musical tastes between China and the West, but in attitudes towards agricultural and sanitation practices.

Manure in China is a precious commodity and the utilization of wastes -- human and animal -- has enabled the country to make quite spectacular strides in feeding its people while improving environmental health in rural areas. In the District of Chien Ann in Hopei province, for example, food production per acre increased by 74 percent in the eight years following the standardization of the management and disposal of excreta and urine in 1964. At the same time, deaths due to diseases transmitted through the wastes decreased by 80 percent.

This was accomplished by establishing scientific procedures for composting the wastes collected from well-designed, hygienic toilets, pig pens and chicken coops: mixed with soil and organic rubbish, the wastes are composted in covered piles or specially designed pits. The fermentation process takes approximately one month and produces a safe, odorless, fertilizer high in plant nutrients.

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But the use of wastes in agriculture is not limited to China. The WHO expert committee on Environmental Sanitation, at its third session more than 20 years ago, stated that, "the committee recognizes the widespread use, in many parts of the world, of human excreta as fertilizer...With the growing world population and the limited extent of world resources, all efforts to utilize sanitary by-products and return them to the soil should be encouraged". Since then, however, research has largely neglected the use of nightsoil as fertilizer and developed countries have tended to condemn this practice.

Yet, the practice was once common in the now-developed countries, before the adoption of waterborne sewerage systems in the mid 1800s and the development of manufactured fertilizers discouraged the reuse of wastes. The installation of waterborne waste disposal in the cities and of septic tanks in the rural areas has taken the developed countries a long time, however. Indoor sanitation for almost all rural Canadian housing was achieved only 10 years ago. Only one country, Sweden, has achieved tertiary treatment for all sewage, and that was two years ago.

The pressures of population and requirements of improved health in developing countries require a much more rapid implementation of effective waste disposal. As many of these countries find themselves with periodic or permanent water shortages, waterborne sewerage methods would be virtually impossible to implement, except perhaps in a few cities. Developing countries must also take into account the environmental hazards these systems pose, hazards that were not fully recognized in the 19th Century.

Whatever technology developing countries adopt to dispose of wastes -- on-site treatment such as pit latrines, composting privies or septic tanks, or off-site treatment -- it does not answer the question of how to make use of the nutrients in human waste. The increasing cost of energy and other resources require more than ever that options be evaluated on the basis of reuse capability as much as of disposal capability.

The possible uses to which waste can be put are numerous. As nightsoil contains the three main plant nutrients -- nitrogen, phosphorous and potassium -- it is a valuable fertilizer and plays a vital role in the rural economy of many developing countries. Its humus value is such that in Korea and Japan, where chemical fertilizers are widely used, nightsoil is added to the fertilizer to improve soil properties. The use of untreated excreta presents serious health hazards, however, and some countries such as India, North Vietnam and China treat the nightsoil before use.

Sewage, treated sewage, and stabilization pond effluents can be used for irrigation. In India, diluted sewage is used directly to irrigate forage and pasture grasses and sugarcane. Israel is conducting experiments in drip irrigation with untreated sewage. Similarly, effluents from stabilization ponds are used to irrigate coconut trees in Madras and tree plantations in Canada and the USA. The irrigation of non-food crops offers the greatest possibilities as the health hazards are greatly reduced.

Re-use of excreta in fish culture, algae production and aquatic plants/ energy production are promising technologies. Throughout Southeast Asia, nightsoil has long been added to fish culture ponds. Adding fish to waste treatment ponds does not depart radically from this traditional practice. Research has shown that the presence of fish improves a pond's functioning by increasing algae removal, reducing suspended solids and coliform bacteria in the final effluent which can then be used for irrigation. A valuable fish crop is also produced.

Algae play an important role in the photosynthetic process of stabilization ponds and their production is rapid, particularly in shallow ponds. Usually 50 percent protein, algae can be an important substitute for grain in animal and fish feeds. Similarly, aquatic weeds such as reeds, bulrushes and water hyacinths help purify the water while yielding a valuable animal food crop.

Wastes, weeds and organic refuse can also be used to produce biogas, a mixture of methane and carbon dioxide generated by anaerobic decomposition. Installations designed to optimize gas production, known as "methane digesters" or "biogas plants", are used in a number of countries: 36,000 are reported in use in rural areas of India, 27,000 in Korea and 80,000 in China. Most of these are small and owned by individual farmers and they provide a good quality fuel for cooking, lighting and heating. The slurry or effluent from the digester is a valuable fertilizer and studies carried out in China show that it is virtually free of hookworm, ascarid and shistosome eggs.

Producing gas and fertilizer while improving the environmental conditions and disposing of human and farm wastes are thus possible in many developing countries where the problem of waste disposal cannot be separated from the problem of waste reuse. And the idea is gaining in popularity in the West as well as energy and fertilizer prices soar.

In fact, the day may not be far off when, if we don't sing about it, we at least use it. At the end of 1977, the US Environmental Protection Agency announced that it plans to press vigorously for "recycling sewage on land". In one Michigan city where a "municipal land treatment operation" was launched, it was found that to operate such a program costs less than one-third of the usual elaborate advanced treatment plants and corn yields in the sprayed fields increased from 30 to 81 bushels an acre.

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The International Development Research Centre recently published Compost Fertilizer and Biogas Production from Human and Farm Wastes in the People's Republic of China.